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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/680,960

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EXAMINER

CHACKO DAVIS, DABORAH

ART UNIT

PAPER NUMBER

1795

MAIL DATE

DELIVERY MODE

07/09/2008

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/680,960	<b>Applicant(s)</b> GE ET AL.	
	<b>Examiner</b> DABORAH CHACKO DAVIS	<b>Art Unit</b> 1795	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 10 March 2008.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-4 and 8-23 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4, 8-23 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-2, 4, 8-10, and 22-23, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent Application Publication No. 2002/0182547 (Raguin) in view of U. S. Patent Application Publication No. 2002/0088393 (Kitano et al., hereinafter referred to as Kitano) and U. S. Patent No. 4,422,904 (Wilkinson).

Raguin, in the abstract, in [0007], [0008], [0009], [0010], [0035], [0039], [0040], [0041], [0052], [0053], discloses rotating a substrate and spray coating at an angle to the surface of the substrate (see figure 6E) a positive-tone or a negative-tone photoresist solution the surface of the substrate (to obtain deep etched structures at least 15 $\mu$ , or greater than 50 $\mu$ ), and moving the spray nozzle across the substrate surface (diameter) so as to ensure a thick photoresist film spread across the substrate surface uniformly. Raguin, in [0035], discloses that the substrate is rotated at a slow rpm during the coating process, wherein the speed is not accelerated during the coating process i.e., the substrate is rotated at a constant speed. Raguin, in [0049], [0053], discloses that the substrate can be non-flat or non-plano substrates. Raguin, in [0053], discloses that the spray nozzle moves along the rail 626 (see figure 6E), i.e., from the

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center to the edge (perimeter) and from the edge (perimeter) to the center, and that the spray thickness depends on the spray velocity. Raguin, in [0036], discloses that the photosensitive material concentration (in the solution) and the viscosity can be adjusted to obtain the desired thickness of the resist film. Raguin, in [0009], and [0038], discloses that the soft baking process is performed at optimal conditions such that residual solvents do not remain in the photoresist film i.e., the solvent in the photoresist solution coated layer is inherently highly volatile than the photoresist itself. Raguin, in [0053], and in figure 6(e) discloses that the photoresist can be spray coated at an angle less than 90 degrees. Raguin, in [0053], and in figure 6E, discloses that the spray nozzle, 623, sprays the photoresist at different angles (reference 624), and that for achieving uniformity the spray method is the most for non-plano or non-flat substrates. Raguin, in [0033], discloses that the substrate is cleaned (primed) with suitable solvents, acid solutions (contact angle less than 90°) etc., so as to improve adhesiveness i.e., the surface is hydrophilic i.e., the surface has a contact angle less than 90 degrees (acute angle, less than 90 degree contact angle includes 40 – 50 degrees), prior to the spray coating of the photoresist solution (claims 1-2, 9-10, 22-23).

The difference between the claims and Raguin is that Raguin does not disclose that the spray nozzle is moved at varying speeds across the substrate. Raguin does not disclose that the nozzle is moved at a speed that increases from the perimeter to the center and decreases, when moved, from the center to the perimeter. Raguin does

not disclose the photoresist to solvent ratio (part of claims 4, and 8) and the claimed viscosity range.

Kitano, in paragraph no. [0125], and in figure 3, and 17B, discloses that the nozzle is moved across the diameter of the substrate at varying speeds. Kitano, in [0002], discloses that the substrate is a non-planar substrate such as an LCD or a mask (a mask has inherently deep etched features). Kitano, in [0119], [0120], and [0125], discloses that the spray nozzle is moved from the peripheral edge portion to the central portion and then moved outwardly from the central portion to the peripheral portion, and that the speed of the nozzle spray is varied to a desired amount depending on the region to be coated so as to obtain uniform thickness. Kitano, in [0075], [0077], [0079], [0083], discloses that the ratio of the resist to the solvent (with at least 5% solid content ) is varied to a range of values so as to keep the viscosity constant. Kitano, in [0138], [0139], and in [0160], and in figure 29, discloses that the viscosity of the resist liquid in the claimed range and that the viscosity is adjusted and determined based on the film uniformity and in accordance with the solid content of the resist material.

The difference between the claims and Raguin in view of Kitano is that Raguin in view of Kitano does not disclose that the viscosity is between one to about three centipoises.

Wilkinson, in col 3, lines 65-67, in col 4, lines 1-2, discloses that the photoresist solution to solvent ratio is about 3:1, and that the viscosity of the photoresist solution is about 1.3 centipoises.

Therefore, it would be obvious to a skilled artisan to modify Raguin by employing the suggestion of Kitano to vary the speed of the nozzle at various regions of the wafer i.e., increasing or decreasing, (while scanning across the diameter of the wafer surface) because Kitano, in [0125], discloses that the moving speed or the scanning speed of the nozzle is varied in order to enable the adjustment of the film thickness for each region of the wafer making it possible to obtain a uniform resist film thickness. It would be obvious to a skilled artisan to modify Raguin by employing the method of adjusting the ratio of the resist content (solid) to the thinner (solvent) ratio, and the resultant viscosity as suggested by Kitano because Kitano, in [0157], and [0158], discloses that adjusting the solid content in the resist solution influences the resist viscosity which in turn can be adjusted in order to maintain film thickness uniformity. It would be obvious to a skilled artisan to modify Raguin in view of Kitano by employing the photoresist solution of the claimed viscosity value as suggested by Wilkinson because Wilkinson teaches in col 4, lines 1-4, that the viscosity value of the coating photoresist solution is selected to as enable the formation of a film layer with uniform thickness across its entire surface.

3. Claim 3, is rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent Application Publication No. 2002/0182547 (Raguin) in view or U. S. Patent Application Publication No. 2002/0088393 (Kitano et al., hereinafter referred to as Kitano) and U. S. Patent No. 4,422,904 (Wilkinson) as applied to claims 1-2, 4, 8-10, and 22-23 above, and further in view of U. S. Patent No. 3,637,384 (Deutsch et al., hereinafter referred to as Deutsch).

Raguin in view of Kitano and Wilkinson is discussed in paragraph no. 5.

The difference between the claims and Raguin in view of Kitano and Wilkinson is that Raguin in view of Kitano and Wilkinson does not disclose that the spray coating is performed in the claimed relative humidity (claim 3).

Deutsch, in col 6, lines 69-73, discloses that the photoresist coatings were formed in an environment under relative humidity conditions of less than 30 percent.

Therefore, it would be obvious to a skilled artisan to modify Raguin in view of Kitano and Wilkinson by employing the claimed relative humidity conditions as suggested by Deutsch because Raguin, in [0035], discloses the presence of vapor in the environment during the coating process, and Deutsch, in col 6, lines 44-75, discloses the claimed conditions to be required in order to form photoresist compositions with improved development latitude.

4. Claims 11, 13-15, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent Application Publication No. 2002/0182547 (Raguin) in view of Research Disclosure (Kenneth Mason Publications, vol.324, April 1991, hereinafter referred to as RD91).

Raguin, in the abstract, in [0007], [0008], [0009], [0010], [0035], [0039], [0040], [0041], [0052], [0053], discloses rotating a substrate and spray coating at an angle to the surface of the substrate (see figure 6E) a positive-tone or a negative-tone photoresist solution the surface of the substrate (to obtain deep etched structures at least 15 $\mu$ , or greater than 50 $\mu$ ), and moving the spray nozzle across the substrate surface (diameter) so as to ensure a thick photoresist film spread across the substrate surface uniformly. Raguin, in [0053], and in figure 6(e) discloses that the photoresist

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can be spray coated at an angle less than 90 degrees. Raguin, in [0033], discloses that the substrate is dried and cleaned (primed) with suitable solutions, solvents, acid solutions etc., so as to improve adhesiveness i.e., the surface is hydrophilic i.e., the surface has a contact angle less than 90 degrees (acute angle, less than 90 degree contact angle includes 40 – 50 degrees), followed by thorough drying prior to the spray coating of the photoresist solution. (claims 11, 13-15,).

The difference between the claims and Raguin is that Raguin does not disclose immersing the substrate in a solution, followed by rinsing in ultra pure wafer.

RD91, in the disclosure, teaches immersing (washing in a solution) followed by thorough rinsing in wafer prior to priming (cleaning in acid) prior to resist lamination.

Therefore, it would be obvious to a skilled artisan to modify Raguin by employing the washing and water rinsing processes suggested by RD91 because RD91, discloses that doing so will prevent insufficient adhesion between the substrate and the photoresist layer to be laminated, and Raguin, in [0033], suggests thorough cleaning of the substrate so as to promote adhesion of the photosensitive material.

5. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent Application Publication No. 2002/0182547 (Raguin) in view of Research Disclosure (Kenneth Mason Publications, vol.324, April 1991, hereinafter referred to as RD91) as applied to claims 11, 13-15 above, and further in view of U. S. Patent No. 4,791,465 (Sakai et al., hereinafter referred to as Sakai).

Raguin in view of RD91 is discussed in paragraph no. 7.



The difference between the claims and Raguin in view of RD91 is that Raguin in view of RD91 does not disclose immersing the substrate in a peroxide-sulfuric solution for five to fifteen minutes and rinsing in ultra pure water for five to ten minutes (claim 12).

Sakai, in col 4, lines 39-56, discloses that the substrates are immersed in peroxide+sulfuric acid solution followed by a water rinsing process for several minutes.

Therefore, it would be obvious to a skilled artisan to modify Raguin in view of RD91 by employing the solution mixtures suggested by Sakai because Raguin, in [0033], discloses that solvents or solutions or acid solutions can be employed for cleaning the substrate surface in order to promote adhesion of the surface with the photosensitive material and reduce the probability of defects caused by surface contamination.

6. Claim 16, is rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent Application Publication No. 2002/0182547 (Raguin) in view of Research Disclosure (Kenneth Mason Publications, vol.324, April 1991, hereinafter referred to as RD91) as applied to claims 11, 13-15 above and further in view of U. S. Patent No. 3,637,384 (Deutsch et al., hereinafter referred to as Deutsch).

Raguin in view of RD91 is discussed in paragraph no. 7.

The difference between the claims and Raguin in view of RD91 is that Raguin in view of RD91 does not disclose that the spray coating is performed in the claimed relative humidity (claim 16).

Deutsch, in col 6, lines 69-73, discloses that the photoresist coatings were formed in an environment under relative humidity conditions of less than 30 percent (less than 50 percent).

Therefore, it would be obvious to a skilled artisan to modify Raguin in view of RD91 by employing the claimed relative humidity conditions as suggested by Deutsch because Raguin, in [0035], discloses the presence of vapor in the environment during the coating process, and Deutsch, in col 6, lines 44-75, discloses the claimed conditions to be required in order to form photoresist compositions with improved development latitude.

7. Claim 17-18, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent Application Publication No. 2002/0182547 (Raguin) in view of Research Disclosure (Kenneth Mason Publications, vol.324, April 1991, hereinafter referred to as RD91) as applied to claims 11, 13-15 above and further in view of U. S. Patent Application Publication No. 2002/0088393 (Kitano et al., hereinafter referred to as Kitano).

Raguin in view of RD91 is discussed in paragraph no. 7.

Raguin, in the abstract, in [0007], [0008], [0009], [0010], [0035], [0039], [0040], [0041], [0052], [0053], discloses rotating a substrate and spray coating at an angle to the surface of the substrate (see figure 6E) a positive-tone or a negative-tone photoresist solution the surface of the substrate.

The difference between the claims and Raguin in view of RD91 is that Raguin in view of RD91 does not disclose the photoresist to solvent ratio (part of claims 17-18).

Kitano, in [0075], [0077], [0079], [0083], discloses that the ratio of the resist to the solvent (with at least 5% solid content ) is varied to a range of values so as to keep the viscosity constant.

It would be obvious to a skilled artisan to modify Raguin by employing the method of adjusting the ratio of the resist content (solid) to the thinner (solvent) ratio, and the resultant viscosity as suggested by Kitano because Kitano, in [0157], and [0158], discloses that adjusting the solid content in the resist solution influences the resist viscosity which in turn can be adjusted in order to maintain film thickness uniformity.

8. Claims 19-21, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent Application Publication No. 2002/0182547 (Raguin) in view of U. S. Patent Application Publication No. 2002/0088393 (Kitano et al., hereinafter referred to as Kitano) and U. S. Patent No. 4,422,904 (Wilkinson) as applied to claims 1-2, 4, 8-10, 22-23, above and further in view of U. S. Patent Application Publication No. 2004/0185368 (Dammel et al., hereinafter referred to as Dammel).

Raguin in view of Kitano and Wilkinson is discussed in paragraph no. 5.

Raguin, in the abstract, in [0007], [0008], [0009], [0010], [0035], [0039], [0040], [0041], [0052], [0053], discloses rotating a substrate and spray coating at an angle to the surface of the substrate (see figure 6E) a positive-tone or a negative-tone photoresist solution the surface of the substrate.

The difference between the claims and Raguin in view of Kitano is that Raguin in

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view of Kitano does not disclose that the photoresist is a cyclohexanone-based resist (claim 20) and that the photoresist is a propylene glycol monomethyl ether acetate based resist (claim 21) and that the solvent is methyl-ethyl-ketone (claim 19).

Dammel, in [0034], discloses that the resist can be a propylene glycol monomethyl acetate based resist or a cyclohexanone based resists and that the solvent employed in the composition is ketone based solvent.

Therefore, it would be obvious to a skilled artisan to modify Raguin in view of Kitano and Wilkinson by employing the resist compositions suggested by Dammel because Raguin, in [0010], discloses using a photoresist material composition to form a layer of thickness greater than 50 $\mu$ , and Dammel, in [0028], [0035], and [0036], discloses priming the substrate prior to spray coating the substrate with the claimed composition in order to promote adhesion of the thick photoresist layer with the surface of the substrate.

### ***Response to Arguments***

9. Applicant's arguments filed March 10, 2008, have been fully considered but they are not persuasive. The 103 rejections made in the previous office action (paper no. 20071113) are maintained.

A) Applicants argue that none of the references disclose a substrate that has a plurality of varying deep trenches that need to be evenly coated.

Raguin, in [0049], and [0053], discloses that the substrates can be non-plano substrates or non-planar substrates i.e., the substrates can have trenches or vias or islands or gates. Kitano, in [0002], and [0172], discloses that the substrate can be an

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LCD substrate or a mask substrate i.e., the substrate will have plurality of trenches with varying depths. Kitano, in [0125], discloses the need varying the speed of the spraying nozzle so as to form a uniform coating on the substrate.

B) Applicants argue that none of the references teach the rotation of the substrate, and the spraying method recited in claims 1, and 22.

Raguin, in [0035], teaches that the substrate is rotated at a slow rpm without any acceleration to its rotation during coating i.e., the substrate is rotating at a constant speed. Raguin, in figure 6E, illustrates the spray nozzle dispensing the photoresist at different angles, that include less than 90 degree angles, and a substrate that has a perimeter and center. The deep features or trenches of the substrate have been addressed in argument A) above. Kitano teaches the varying speed of the spray nozzle i.e., the speed of the nozzle can be increased or decreased, and as discussed in paragraph no. [0119], of Kitano, the nozzle moves from the periphery to the center and vice versa, and in [0125], discloses that the nozzle speed is varied i.e., depending on the region to be coated the speed is either increased or decreased so as to achieve uniformity.

### ***Conclusion***

10. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

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mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daborah Chacko-Davis whose telephone number is (571) 272-1380. The examiner can normally be reached on M-F 9:30 - 6:00. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F Huff can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/John A. McPherson/  
Primary Examiner, Art Unit 1795

dcd

July 3, 2008.